

## Brief introduction to electrical maintenance of ZF 4wg200 transmission

ZF 4wg200 gearbox is the product of ZF, a German transmission system supplier. It adopts electro-hydraulic control and fixed shaft power shift gearbox. The gears are the first four and the last three, and the supporting engine power is about 200kW. It is commonly used for 5-ton and 6-ton loaders.

The transmission system is composed of gear selector, electric control box, sensor, transmission control valve, transmission, etc. the control flow is shown in Figure 1:

Circuit faults mostly occur in gear selector, electric control box, control solenoid valve, sensor and line connection.

They are introduced below:

### 1. Gear selector:

The outline of DW — 3 selector is shown in Figure 2:

It is equivalent to a multi contact selection switch to realize forward gears 1, 2, 3 and 4 and reverse gears 1, 2, 3 and 4 of the loader Gear 4 and power cut-off (i.e. neutral 1, 2, 3 and 4). It is equipped with a bunch of signal lines in red (baseline), blue, green, black, yellow, gray, pink and purple respectively. The gear selector generates signals of each gear through the combination of various color lines. Under normal conditions, the resistance value between each color line corresponding to each gear and the baseline is 0. As shown in Table 1: ("√" indicates that the resistance value is 0)

It is not difficult to draw the following conclusions from table 1:

- if there is an open circuit on the red line or black line, the transmission has no gear. At this time, although the whole machine has been started, it cannot run.
- if the yellow line is broken, the transmission has no forward gear. At this time, the whole machine cannot move forward, but it can move backward.
- if the pink wire is broken, the transmission has no reverse gear. At this time, the whole machine cannot move backward, but it can move forward.
- if the gray line is broken, the transmission has no neutral. At this time, the whole machine cannot stop running. (in fact, you can press the parking brake to stop the whole machine, see below)
- purple line is responsible for KD gear. If it is open circuit, it will no longer have KD function. Although the driving of the whole machine will not be affected, the operation will be cumbersome and the efficiency will be reduced during shovel loading.
- if other color lines are broken, there will be no corresponding gear. Through the actual debugging of each gear, the specific fault line can be determined.

### 2. Electric control box:

The internal is a single chip microcomputer, which receives the electrical signal from the gear selector and sensor and outputs the electrical signal of the control solenoid valve.

- the speed sensor is on the gearbox, and the standard resistance value is 1020  $\Omega$ . If the actual measured resistance is high, the gearbox has gears 1 and 2, but no gears 3 and 4.

- the pressure sensor is connected to the air circuit of the main engine braking system. The layout positions of different models of products are slightly different, which can be found from the electric control box along the harness direction. If there is a fault, the transmission has no gears 1 and 2, but gears 3 and 4. If the parking brake pedal is pressed during driving normally, the transmission will automatically turn to neutral while the whole machine is braking, that is, the power will be cut off.
- there is also a neutral signal line connected to the engine starting line. The engine can be started only when the gear selector is in the neutral position, that is, the system has the neutral start protection function. If the line is disconnected, it cannot be started even in the neutral position.
- there are four power lines connected to the electric control box, two power lines and two ground wires. During use, pay attention to check that these four lines must be kept unblocked. It should be noted that the single chip microcomputer in the electric control box is the chip control core. When welding on the host product, it may be reverse breakdown due to sharing the grounding terminal. Therefore, disconnect the plug of the electric control box before operation.

### 3. Control solenoid valve:

The part near the left in Figure 3 is the control solenoid valve

The control signal output by the electric control box is transmitted to the solenoid valve through the harness. Make it move. Control the movement of each valve core in the variable speed control valve, and then control the output of each gear oil circuit. There are five solenoid valves installed on the side of the variable speed control valve, M4, m3, M5, M2 and M1 from top to bottom. The standard voltage of the solenoid valve after power on is 24V. If the voltage measured by the multimeter is inconsistent with it, it indicates that the solenoid valve is faulty. The relationship between the solenoid valve and each gear is shown in Table 2: ("√" indicates that the voltage is 24V)

It is not difficult to draw the following conclusions from table 2:

- if M1 fails, the whole machine has no backward gear. At this time, the loader can only move forward, not backward. If M2

If there is a fault, the whole machine has no forward gear 1, reverse gear 1 and neutral gear 1. And so on.

- generally speaking, the seven gears of the first 4 and the last 3 are still the eight gears of the first 4 and the last 4, but the outputs of the last 3 and the last 4 are the same.

### 4. Line:

The line only serves as a connection, as long as it remains unblocked. Note that the joint must be firmly connected, and the damaged part of the line cannot be grounded, which shall be wrapped in time.

The above is a brief introduction to the electrical system of zf4wg200 transmission. After understanding the principle, customers can judge and eliminate faults by themselves according to their actual ability. In addition, if the loader fails, the troubleshooting shall be in the order from outside to inside, from simple to complex. If the fault is the original fault of the transmission system, first check the oil level, oil pressure and oil temperature, then check the

wiring and components of the electrical system, and finally check the mechanical and hydraulic reasons.